

CHAL-0307
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January 2, 1959

25 YEAR RE-REVIEW

MEMORANDUM FOR: Project Director

SUBJECT : Granger Jammer

In my last report of approximately 1 December 1958, I asked for time to measure the results of three small and simple changes in the Granger box and to investigate higher powered devices. This has been completed. This paper discusses the results and makes two alternate recommendations for our next move.

The changes in the box produced very significant results. Pilot Githens, a man with several hundred hours of training in the attack aircraft using the radar for controlled intercepts was thrown out of lock about once each mile of flight on his first runs. By maneuvering he was always able to regain lock. This follows since the jammer stops its action as soon as lock is broken. A test is now under way wherein the jammer stays on for a period after break-lock in order to discourage new locks. This break lock occurred up to about three miles from the target. However, with six hours of experience, he had improved his skill so that on his one best run, he was not thrown out of lock except outside eight miles. The slow response of the radar allows for pilot corrections to the effect of the jammer. After this best run (for the attacker) several more poor runs occurred (i.e. runs wherein he lost lock regularly (once per mile or more) up to three miles and less. The data for ranges less than three is insufficient for sound conclusions. More data under three miles will be taken.

It should be remembered that we have tested this box under the most unfavorable (most favorable for the attacker) conditions that exist anywhere in the world. The GCI facility and operational personnel at Mugu are tops. It is their responsibility to test operationally all U.S. airborne missile systems. In Pilot Githens we have one in a thousand for pilot skills on a particular airborne missile. But this thought can best be summed up in pilot Githens own remarks made after four hours of experience at trying to defeat the Granger box in its last configuration. These remarks are on tape and are an attachment to this report.

In order to improve the results of the box, more power is needed. [redacted] of 25X1 Stanford and I are of the opinion that against the radar in the kind of missile system represented by Sparrow III (this is the one we have been testing against) it is not possible to be sure that any particular and reasonable power will succeed in always breaking locks. The slow response of the system allows pilot skills and GCI crew skills to enter the picture in a large way. We believe 1000 watts will do it but can't be sure. 1000 watts would require 100 lb. of equipment. We also believe 50 watts would do it but are less sure. 50 watts can be built for 50 lbs.

It should be remembered that the present Granger box would defeat an attacker using guns, rockets or beam rider missiles (Sparrow I type). The only known Soviet airborne missile is judged to be a beam rider type. The present box would probably defeat a passive or semi-active type missile of the Sidewinder or Sparrow III type, (not considering the jammer's CW effort) but this result against these missiles may be a function of pilot skill and GCI skill as stated above. This later statement follows from

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the errors that are created in the AI radar used for launching so that the missile, if launching is possible, is not likely to be able to make the necessary homing corrections for a hit.

A. Granger box recommendations:

1. That Granger make permanent the ~~changes~~ made in the box on a temporary basis.
2. That no more changes be made (except one now under test) unless a better idea be presented than has yet been heard by the writer. In other words, we freeze the design subject to reopening the design only for outstanding ideas.
3. That Phase III and Phase IV checks on the box be run at once under ordinary conditions as originally planned.

B. An alternate course of action:

1. Have a 50 watt box built, either Granger Associates or Sanders Associates could do this with equal skill. The decision between the companies should depend on non-technical points: (a) Granger is already familiar with the problem in detail (b), Granger has personnel cleared and in contact with Edwards (c) Sanders would bring fresh look into the problems. I tend to favor Granger since (a) they have more familiarity with our problem and (b) their close tie with Stanford and Bill Rambo, our consultant.

This plan is expected to take perhaps one year with moderate luck on the tube. 50 watt tubes are less reliable than the one watt tube we are using. Isolation troubles will increase which might mean no better results at long ranges than we have now.

SUMMARY:

It would appear that the results to be expected from the higher power (50 watt tube) would not justify the time and effort required for immediate operational needs. An all-out effort should be made to complete the evaluation and assuming that this evaluation is favorable put the present box into immediate production.

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P.S. This paper was discussed with Mr. B. on 30 December. He suggested that the importance justified a joint approach following both recommendations A and B above with B being done more leisurely and A being continued at top speed. We also discussed and agreed on a

further objective - that of making the present box so that either Granger or Litton tubes can be used, depending on dependability, availability, etc. by a field mod kit of connectors, etc.

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